DARPA Phoenix Payload Orbital Delivery (POD) System: Progress towards Small Satellite Access to GEO

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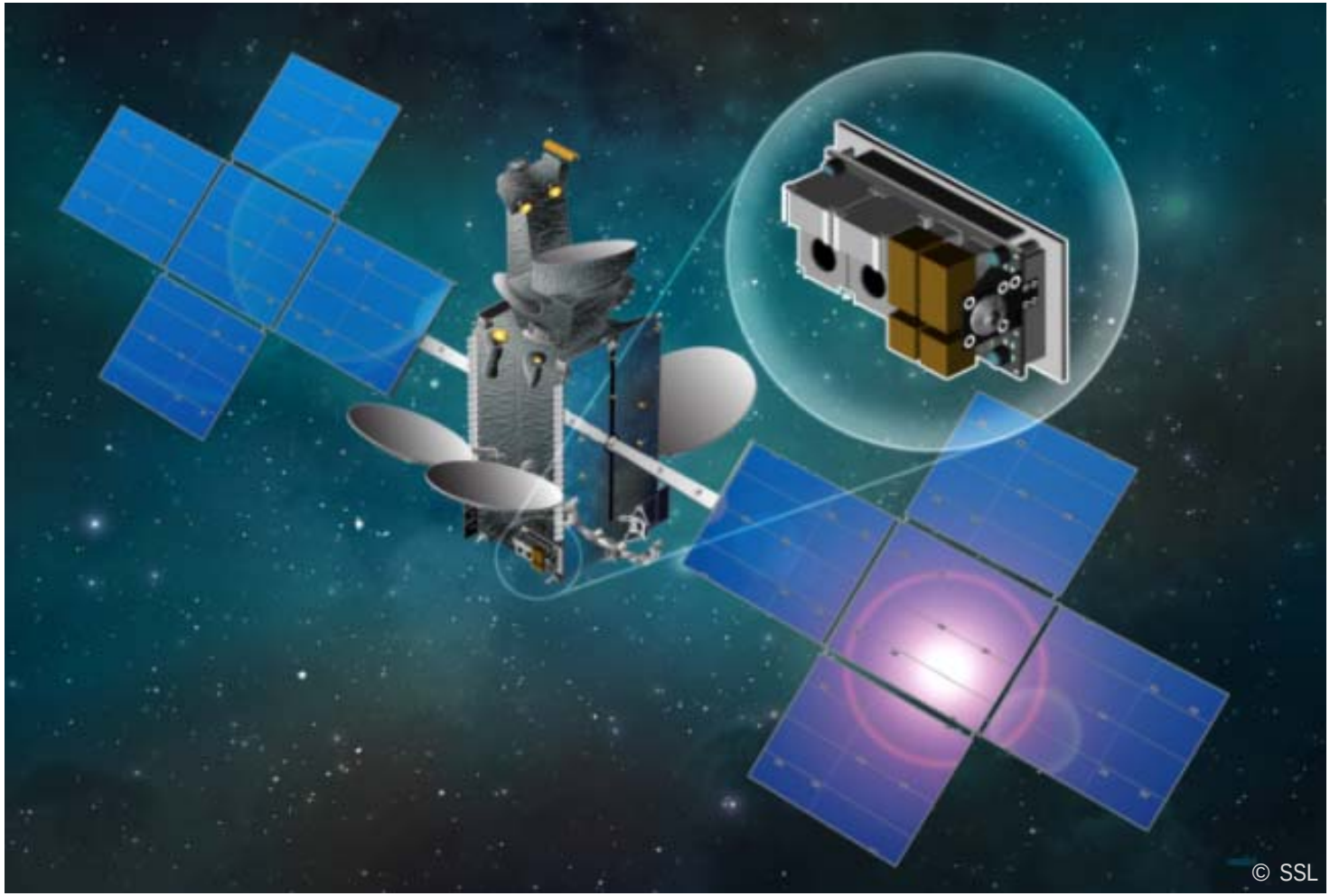
Payload Orbital Delivery (POD) System Summary

- **Releasable** hosted payload
- Delivers up to **90 kg** (standard) or **150 kg** (extended) to orbit
- Launch opportunities to **GEO and GTO** multiple times per year



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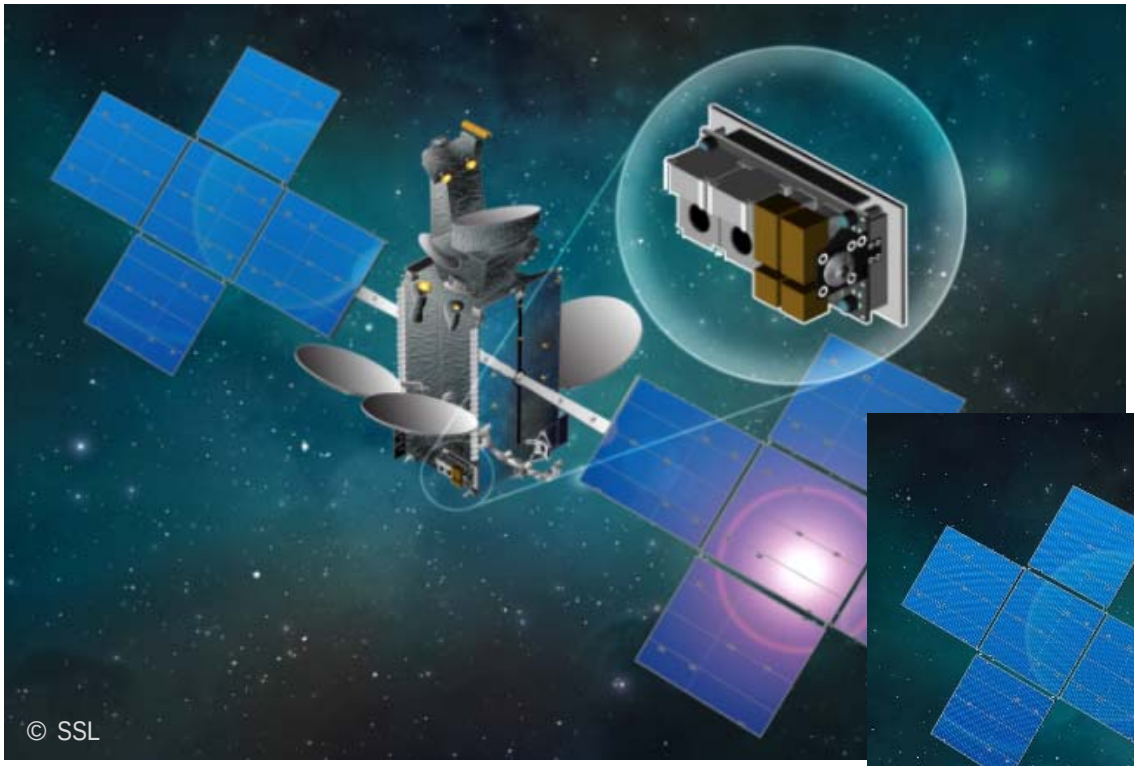
SSL Satellite Locations Frequently Available for POD Rideshare



Unused Battery Compartments on East/West Faces

Mid-Panel on East/West Faces

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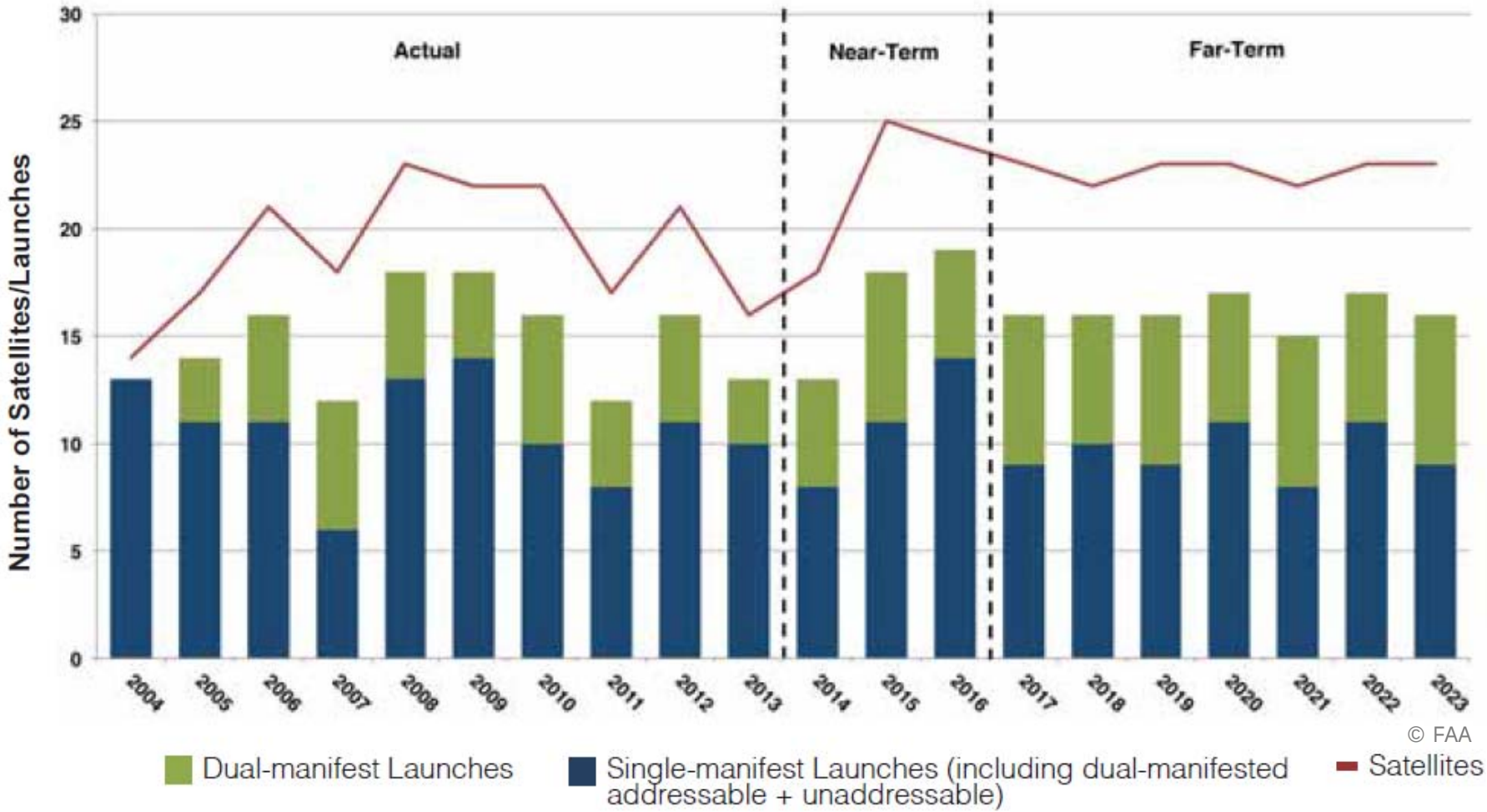
Annual POD Hosting Opportunities
(FAA 2014 Commercial Space Transportation Forecast)

- ~15 launches per year through 2023
- ~5-7 could be able to accommodate a POD



Typical POD Launch Mission Timeline, Mass and Volume Options

Event	Milestone Date
Contract Signing	Launch – 24 months
Separation System Delivery	Launch – 12 months
POD or POD mass model delivery	Launch – 9 months
PODS Final Integration to Host	Launch – 2 months
Ship to Launch Base	Launch – 1 month
Launch	Launch

HPA Option	HPA Maximum Mass	HPA Volume [L x W x H]
Standard HPA	90 kg	90.9 x 45.7 x 40.0 cm^3
Extended HPA	150 kg	90.9 x 90.9 x 60.0 cm^3

Payload Mass Range	Payload Footprint
15 Kg – 30 Kg	20 cm x 20 cm (minimum)
30 Kg – 60 Kg	30 cm x 30 cm (minimum)

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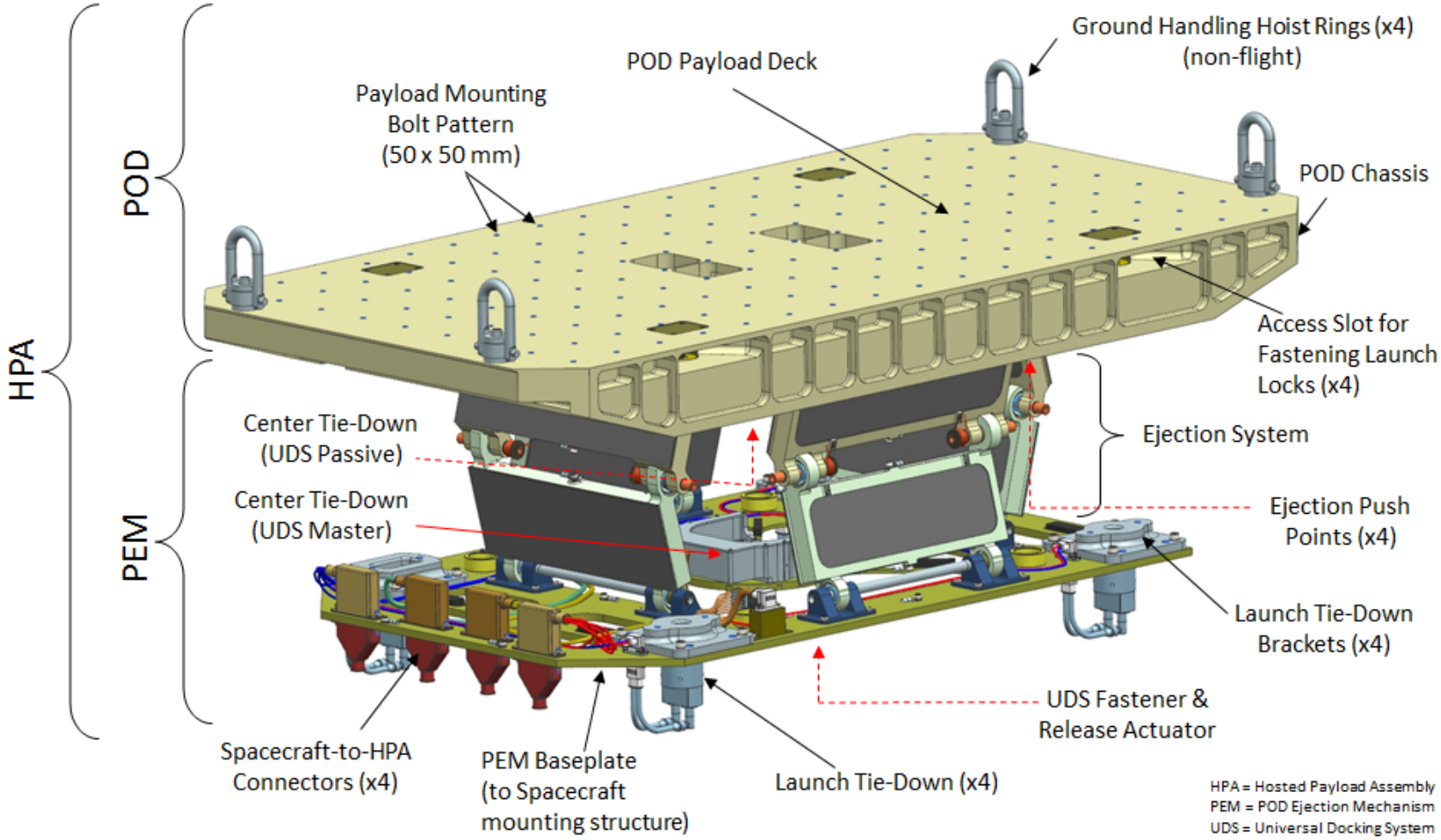
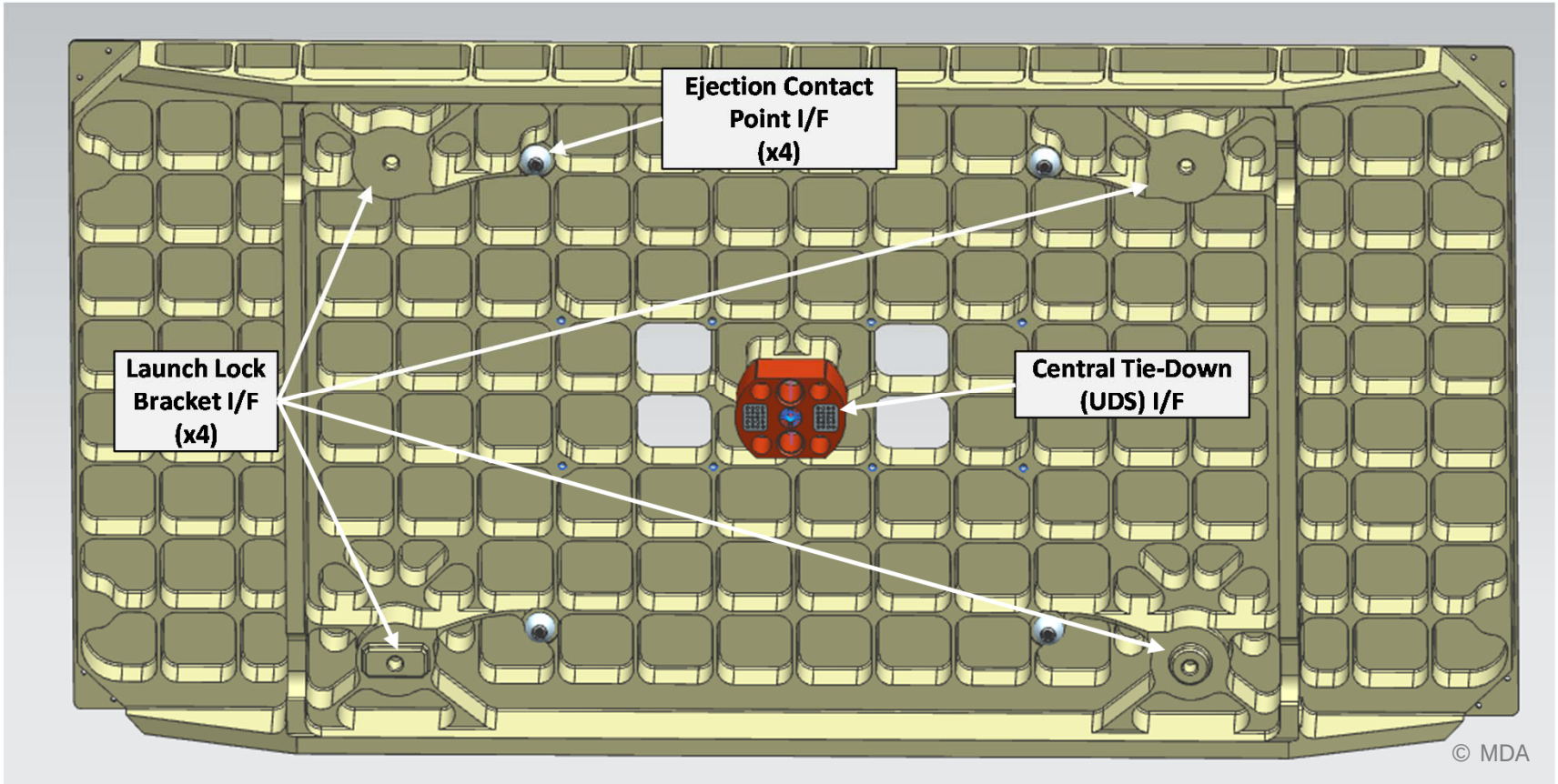
Standard Hosted POD Assembly (HPA)



Patent Pending (PCT/CA2015/050451)

Standard POD Chassis (Underside) to POD Ejection Mechanism (PEM) Interfaces



Interfaces between the POD chassis and POD Ejection Mechanism (PEM):

- Launch lock brackets
- Final central tie-down
- Ejection contact points

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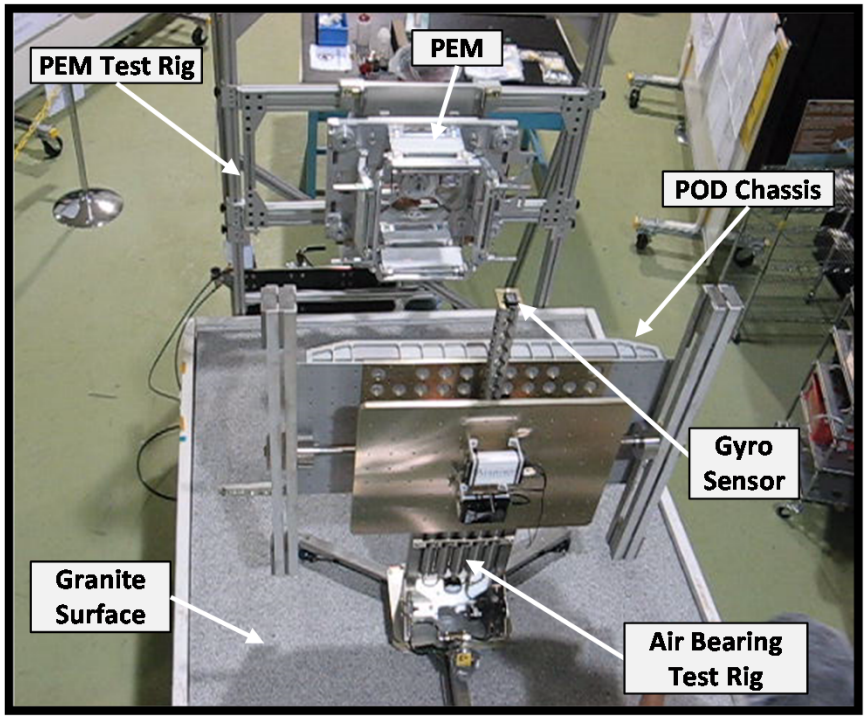
Hosted POD Assembly (HPA) Ground Test Results

Successful green runs before June 2015 HPA CDR



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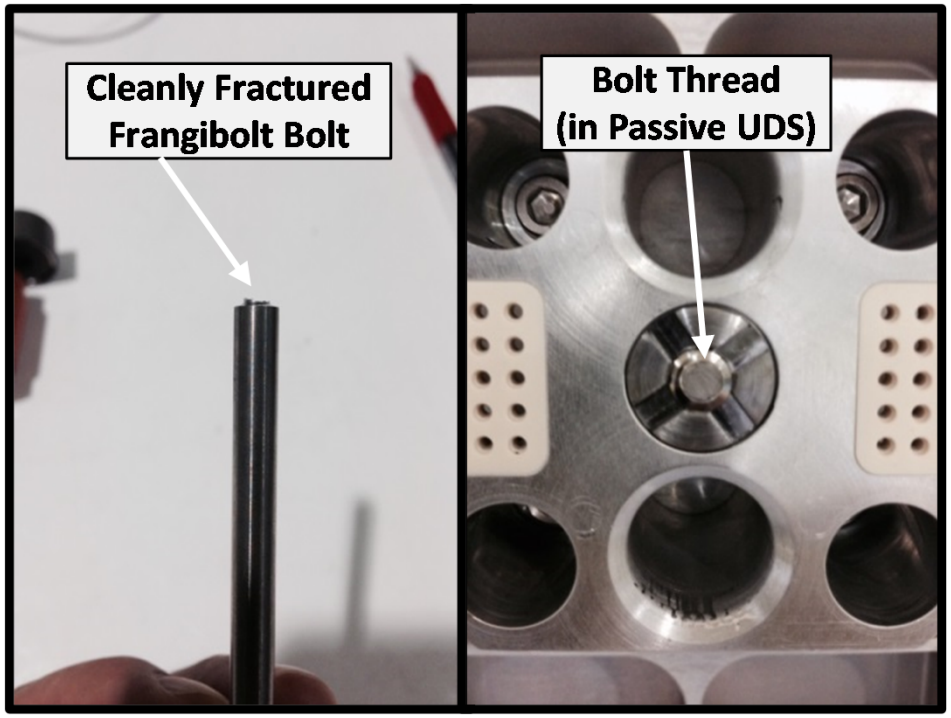
Engineering Models on HPA Performance Test Rig at MDA Robotics and Automation



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Fastener Release Test for POD Final Tiedown (Universal Docking System [UDS] from MDA US LLC) – Severed Fastener

Future of POD

- **The first deployment of a POD in orbit is planned for March 2017.**
- The POD system could enable **high delivery tempo to GEO for small payloads**.
- Once the POD system capability is established, a POD could be **integrated into a host spacecraft quite late in the integration flow**, creating an "express delivery to GEO" capability.
- Designing and verifying the POD system to a standard user's guide could ensure **compatibility with most of the ~15 commercial launches to GEO each year**.
- Other satellite providers besides SSL should be able to accommodate PODs with limited development and impact to existing bus designs as a new method for **delivering small-mass hardware items, small spacecraft and potentially fuel** to GEO at a higher tempo than has previously been possible.
- **New concepts of operation** could be considered:
  - A host satellite could conceivably take advantage of on-orbit robotic services to have a new electronics box attached via the empty POD mechanical, power and data connections where the POD was ejected.
  - This concept raises the entirely novel possibility of adding new capabilities, providing external diagnostics or adding fresh revenue streams to existing on-orbit spacecraft.

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For more information

- On SSL POD flight opportunities:
  - Al Tadros, SSL (al.tadros@sslmda.com, (650) 714-0439)
  - Laurie Chappell, SSL (laurie.chappell@sslmda.com, (650) 852-2569)

- On DARPA Phoenix program:
  - Dr. Jeremy Palmer, DARPA PM (jeremy.palmer@darpa.mil)

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